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Faunal complex of the Early Pleistocene Muhkai 2 locality

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ABSTRACT

The Early Pleistocene locality Muhkai 2 was discovered in Central Dagestan, northeastern Caucasus, Russia, in 2006. Archaeological investigations of the site have been directed by Corresponding member of RAS H.A. Amirkhanov (Institute of Archaeology RAS, Moscow). The article presents the results of the study of osteological material from the excavations of 2006–2017. The cultural layers with stone tools and mammal bones are found within stratum of brownish-grey petrified loams with reversed magnetization. We identified 14 large species of mammals, which are indicators for the dating of the faunal assemblage and crucial in identifying the specific characteristics of the natural environment at the time of site formation. Stenon horse and Etruscan wolf dominate the spectrum of species at Muhkai 2. All large mammal species from the site are inhabitants of open and semi-open landscapes and animals indicative of closed biotopes are absent. The biotope appears to have been a dry savannah-steppe with small areas of forest vegetation. The climate at this time was warm and quite arid. Most likely, the animals died here due to natural causes and their carcasses were buried at the bottom of an ancient, slightly saline and shallow, temporary body of water. Data from the theriofauna place the age of the site Muhkai 2 within the chronological range of 2.1–1.77 Mya.

Keywords: Early Pleistocene, faunal complex, Muhkai 2 locality, northeastern Caucasus, osteological material

Фаунистический комплекс раннеплейстоценового местонахождения Мухкай 2

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РЕЗЮМЕ

Раннеплейстоценовое местонахождение Мухкай 2 было обнаружено в 2006 г. в Центральном Дагестане (северо-восточный Кавказ, Россия). Археологическое изучение памятника проводилось под руководством члена-корреспондента РАН Х.А. Амирханова (Институт археологии РАН, Москва). В статье изложены результаты исследования остеологического материала из раскопок 2006–2017 гг. Культурные слои, содержащие каменные орудия и кости млекопитающих, обнаружены в толще обратно намагниченных коричневато-серых окаменелых суглинков. Нами было определено 14 видов крупных млекопитающих, наличие которых позволило уточнить время существования данного фаунистического комплекса, а также особенности природного окружения во время образования местонахождения. Лошадь Стенона и этрусский волк доминируют в фауне Мухкая 2. Все виды крупных млекопитающих, обнаруженные на данном местонахождении, являются обитателями открытых и полуоткрытых

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ландшафтов, – жители закрытых биотопов здесь отсутствуют. Похоже, это была сухая саванна – степь с небольшими участками лесной растительности. Климат в это время был теплым и довольно засушливым. Скорее всего, животные погибли здесь по естественным причинам, а их тела были захоронены на дне древнего слабосоленого временного водоема. Состав териофауны Мухкая 2 позволяет датировать данное местонахождение временным интервалом 2.1–1.77 млн л.

Ключевые слова: ранний плейстоцен, фаунистический комплекс, местонахождение Мухкай 2, северо-восточный Кавказ, остеологический материал

INTRODUCTION

Since the end of the XX century, two Early Pleistocene sites with abundant mammalian fauna, dated to 1.86–1.77 Mya, – Dmanisi (Georgia) and Palan-Tyukan (Azerbaijan) – have been known in the Caucasus (Sablin 1990; Kuzmina and Sablin 1991; Gabunia and Vekua 1993; Vekua 1995). In 2006, the site Muhkai 2 was discovered in Central Dagestan, northeastern Caucasus, Russia (geographical coordinates – N 42°14.464', E 47°21.314') (Fig. 1). Since this moment, archaeological investigation of the site has been carried out by the Institute of Archaeology RAS (Moscow) and the Institute of History, Archaeology and Ethnography, Dagestan Federal Research Centre of RAS (Makhachkala, Dagestan) (Ozherelyev 2010, 2017; Amirkhanov et al. 2012a, 2012b; Sablin et al. 2013). The deposits at the Muhkai 2 site have a total thickness of 73 m and include 129 lithological layers. The cultural layers with stone artifacts and a large number of fossil bones are found in a stratum of reversed magnetized (below the Olduvai event) brownish-grey petrified loams in the middle portion of the section (Amirkhanov and Ozherelyev 2011; Amirkhanov et al. 2012b, 2016a; Amirkhanov 2016; Ozherelyev 2019). The thickness of the brownish-grey loams containing the osteological material, large carbonate concretions and pebbles and filled with sandy-clay varies between 5 and 40 cm (Ozherelyev 2019). The available data indicate that the site was located near a slightly saline body of water with periodic fluctuations in the water level (Stolpnikova et al. 2016). Apart from numerous bones of large mammals, a few bones of small mammals (10 bones), Aves (9 bones), Lacertilia (3 bones), Anura (10 bones), and also a chela fragment of a semi-terrestrial freshwater crab *Potamon* sp. were recovered (Amirkhanov et al. 2016a; Sablin 2020). At the base of the brownish-grey loams containing the osteological material there is a horizon of shells of terrestrial mollusks (*Geophila* Férussac, 1819). The animal remains appear to either have been buried *in situ* or only minimally affected by secondary fluvial and proluvial processes (Sablin 2016a). After the waterbody dried out, the bone material was sealed in the loam, which, in turn, was buried in the course of further geological events.

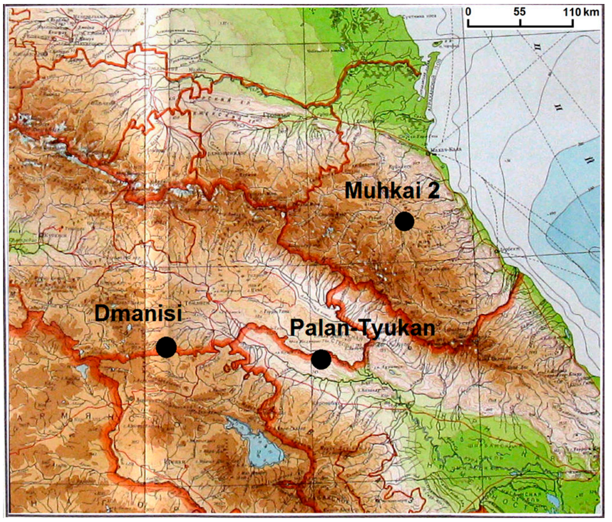


Fig. 1. Map of Early Pleistocene sites of the Caucasus with rich mammalian faunal assemblages mentioned in the text – Muhkai 2 (Russia), Dmanisi (Georgia), Palan-Tyukan (Azerbaijan).

MATERIAL AND METHODS

In total, 2498 large mammal bones were identified from the Muhkai 2 cultural layers in 2006–2017 (Table 1). The analysis was undertaken using the comparative collection stored in the Zoological Institute RAS (Saint Petersburg, Russia). Indeterminate specimens account for 32.5% of the total number of faunal remains from the site, and for the most part these are fragments of ribs and vertebrae of large mammals. The bulk of the determined remains are

Table 1. Remains of large mammals from the site Muhkai 2 (2006 to 2017 excavations).

Species	NISP	MNI
Canis etruscus Forsyth-Major, 1877	646	13
Vulpes alopecoides Forsyth-Major, 1877	17	1
Pliocrocuta perrieri Croizet et Jobert, 1928	35	3
Megantereon cultridens Cuvier, 1824	2	1
Lynx issiodorensis Croizet et Jobert, 1928	26	3
Acinonyx pardinensis Croizet et Jobert, 1928	7	1
Archidiskodon meridionalis Nesti, 1825	46	2
Equus (Allohippus) stenonis Cocchi, 1867	1206	44
Palaeotragus priasovicus Godina et Baiguscheva, 1985	3	1
Libralces gallicus Azzaroli, 1952	1	1
Eucladoceros senezensis Deperet, 1910	130	10
Gazellospira torticornis Aymard, 1854	182	12
Gazella bouvrainae Kostopoulos, 1996	97	11
Gallogoral meneghinii Rutimeyer, 1878	100	7
Total	2498	110

NISP: Number of Identified Specimens; MNI: Minimum Number of Individuals

fragmented skulls, isolated mandibles, teeth, and limb bones. There are no intact skeletons in the assemblage studied so far. However, we did find many bones in articulation or linked anatomically, which indicates that parts of the carcasses of the dead animals were buried relatively quickly at the bottom of the ancient body of water, before the destruction of muscles and ligaments took place. Seemingly, the faunal material appears to be the result of a natural, rather dynamic accumulation of mammalian remains in the water, accompanied by different sequences and rates of carcasses disintegration. All the bones are glaringly white and are fossilized to the same degree in all layers, which indicates similar burial conditions throughout the fossiliferous deposits (Sablin 2016b). This is similar to the situation at the Early Pleistocene site of Dmanisi, where the remains of animals and hominins are also weakly colored. This is rather unusual and, in the case of the finds from Mukhai 2, attests to an excessive concentration of calcium carbonate in the ancient shallow waterbody.

The calculation of the minimum number of individuals (MNI) was carried out using a combination of parameters such as re-fittings, bilateral symmetry and attribution to male or female according to techniques widely used in paleontological and zooarchaeological studies (Shipman 1981; Klein and Cruz-Uribe 1984; van Wijngaarden-Bakker 2001).

RESULTS

The osteological material is relatively well preserved (stage 1 according to A. Behrensmeyer (1978)), which may indirectly indicate that the remains were buried fairly quickly. No gnawing traces or traces of root damage were observed. The form of the transverse fracture of the tubular limb bones (Shipman 1981), could not be reliably characterized, since in most cases, the original traces were damaged during cleaning of the petrified loams from the bones. Four well-preserved hyena coprolites were also discovered among the osteological material. Similar samples are known from Dmanisi too (Vekua 1995).

In total, 110 individuals of six species of carnivorous and eight species of herbivorous mammals were identified at Muhkai 2 (Table. 1). The remains of medium-sized mammals predominate. The Canidae were represented by: the jackal-like Etruscan wolf *Canis etruscus* Forsyth-Major, 1877, and the corsac-like fox *Vulpes alopecoides* Forsyth-Major, 1877. It should be noted that a lot of bones of Etruscan wolf are present in the osteological material, making up

Table 2. Skeletal elements of carnivores from the site Muhkai 2.

Bones	*Canis etruscus*	*Vulpes alopecoides*	*Pliocrocuta perrieri*	*Megantereon cultridens*	*Lynx issiodorensis*	*Acinonyx pardinensis*
Cranium	12					
Maxilla	2	2	3		2	1
Mandibula	20	2	3		2	
Tooth	40	3	11		9	
Sternum	4					
Vertebrae	117		5		1	
Os costa	19					
Sacrum	2					
Scapula	6				2	1
Humerus	15	1	1		3	1
Ulna	16		1			
Radius	22		1		1	3
Pelvis	4	1	2		1	
Femur	16	1			1	
Patella	4					
Tibia	12		2		1	
Metacarpal/metatarsal	50	2		1		
Astragalus	7					
Calcaneus	9	1				
Carpal/tarsal	110	2	6	1	2	1
Phalanx	159	2			1	

25.8% of the total number of identifiable specimens (NISP). 11.8% of the total MNI could be attributed to *C. etruscus* (Table 1). Up to 13 individuals of Etruscan wolf (including one cub) may be represented. All body parts are represented (Table 2). In terms of skeletal preservation by anatomical parts, elements of the cranial and postcranial skeleton exhibit a similar representation. It appears that complete carcasses of Etruscan wolf were brought to the site by the stream. The ancient hyena *Pliocrocuta perrieri* Croizet et Jobert, 1928 (family Hyaenidae) is represented by 35 bones (Table 1, 2). The total number of animals may be up to three individuals. This includes two adults and one cub. The Felidae, such as the saber-toothed cat *Megantereon cultridens* Cuvier, 1824, the large steppe lynx *Lynx issiodorensis* Croizet et Jobert, 1928, the giant cheetah *Acinonyx pardinensis* Croizet et Jobert, 1928 are represented by relatively low counts of remains (Table 1, 2). Butchering marks (cut marks) related to skinning, disarticulation and defleshing were not observed on any of the carnivore bones.

Remains of Stenon horse *Equus (Allohippus) stenonis* Cocchi, 1867 dominate the spectrum of herbivores at Muhkai 2. 48.3% of the total NISP and 40% of the total MNI could be attributed to this animal (Table 1). The structure of the teeth is typical for the species. The remains of 35 adult horses and 9 foals were found. Overall, limb bones (81.1%) predominate in the assemblage of Stenon horse remains (Table 3). The tubular bones of the fore and hind limbs of this odd-toed ungulate are proportionately represented. Six systematic deep V-shaped cut marks are located on the flattened front surface of the upper epiphysis of a Stenon horse femur, in the area where tendons and muscle ligaments connect the femur to the pelvic

Table 3. Skeletal elements of herbivores from the site Muhkai 2.

Bones	*Archidiskodon meridionalis*	*Equus (Allohippus) stenonis*	*Palaeotragus priasovicus*	*Eucladoceros senezensis*	*Libralces gallicus*	*Gazellospira torticornis*	*Gazella bouvrainae*	*Gallogoral meneghinii*
Cranium	1	17		2		1	9	5
Maxilla		15		9	1	13	19	5
Mandibula	1	39		20		22	28	7
Tooth	30	52		27		6	26	7
Antler				3		5	6	1
Vertebrae	1	69		2		1	4	13
Os costa	2							
Sacrum		2					1	
Scapula		2		1		2		2
Humerus	1	41		3		10		5
Ulna	1	17		2		7		2
Radius		59		5		13		6
Pelvis	4	32				7	2	2
Femur	3	19		4		5	1	2
Patella		1		1				1
Tibia	2	104		6		17	1	13
Metacarpal/ metatarsal		74	1	12		8		6
Astragalus		72		3		3		3
Calcaneus		60		5		1		2
Carpal/tarsal		350	2	25		57		3
Phalanx		181				4		15

bone. Judging by the direction of the cut marks, they may have been produced when the horse's back limb was separated by transection of the *gluteus minimus*, *gluteus medius* and *gluteus maximus* muscles (Amirkhanov 2016; Amirkhanov et al. 2016b). In the literature, cut marks in these locations are unambiguously interpreted as a result of butchering and/or cutting off meat (Binford 1981; Olsen 1987). It is fair to suppose that ancient people disarticulated the carcasses here in order to transport their parts to some other place.

Large herbivores are represented by the southern mammoth *Archidiskodon meridionalis* Nesti, 1825 (46 bones) and the ancient giraffe *Palaeotragus priasovicus* Godina et Baiguscheva, 1985 (3 bones) (Table 1, 3). The remains of one adult southern mammoth and one 4-year-old calf were found. Two species of Cervidae were identified: the ancient elk *Libralces gallicus* Azzaroli, 1952 (1 bone), and the bush-antlered deer *Eucladoceros senezensis* Deperet, 1910. 5.2% of the total NISP and 9.1% of the total MNI could be attributed to the bush-antlered deer (Table 1). Up to ten individuals of *E. senezensis* may have been present, including two adults and eight fawns. The Family Bovidae is represented by three species of antelopes *Gazellospira torticornis* Aymard, 1854, *Gazella bouvrainae* Kostopoulos, 1996 and *Gallogoral meneghinii* Rutimeyer, 1878. 15.2% of the total NISP and 27.3% of the total MNI could be attributed to the antelopes (Table 1). The remains of 26 adult Bovidae individuals and four calves were found. More specifically: the total number of *G. torticornis* may

be 12 individuals. This includes ten adults and two calves. The remains of six adult goral-like antelopes and one calf were found. The total number of *G. bouvrainae* could be 11 individuals – ten adults and only one calf. Differences in the anatomical composition of the bones between the even-toed ungulates have not been identified. Moreover, it should be noted that the limb bones (49.2%) and the remaining skeletal parts (50.8%) of these animals are represented proportionally (Table 3). None of the bones of these herbivores display butchering marks (cut marks) related to skinning, disarticulation and defleshing.

DISCUSSION

The cultural layers are of special interest paleontologically. The spatial distribution of large mammalian bones within the excavated areas is clear and regular. The finds are densely deposited within depressions at the base of the waterbody, which formed in the greyish clay and were filled up with brownish loam. Here lies *in situ*, among other bones, the rear part of the cranium of the calf of southern mammoth; two crania, the right femur with systematic deep V–shaped cut marks, the metacarpal of the Stenon horse and the fragment of the cranium of a goral-like antelope with a horn. Several large tubular bones are oriented along the long axis of the depression. However, few bones show uniformity in their orientation. The brain cavity of the cranium of the southern mammoth calf had been filled by the petrified loams and pebbles. Therefore, that specimen appears to have been buried after the destruction of the base of the skull.

For most researchers of the second half of the 20th century it seemed obvious that the resettlement of the genus *Homo* outside Africa did not happen before 1.0 Mya (Dennell and Roebroeks 1996). Our recent studies have substantially expanded the geography and chronology of the earliest human presence in Eurasia (Sablin 2011). Thus, the discovery of the Muhkai 2 site as well as the discovery of traces of stone tools on the surface of the metatarsal of *Paracamelus alutensis* Stefanescu, 1895 (Sablin and Girya 2009, 2010) confirms the presence of the genus *Homo* in the south of the European part of Russia during the time-range 2.1 to 1.97 Mya.

Nevertheless, human activity seems to have played a minimal role in forming the taphocenose, since the bone accumulation here was primarily due to hydrodynamic and sedimentary factors which, in turn, depended on local paleoenvironmental and paleoclimatic conditions during the deposition of the brownish-grey loams containing the osteological material (Sablin et al. 2018; Sablin 2020). Based on this, we suggest a possible scenario for the formation of the Muhkai 2 bone accumulation.

Most likely, the animals died here due to natural causes, such as drowning, in a short autumn “rain” season during catastrophic heavy precipitation following a long drought. The rapid flow of water transported the corpses during a flooding in significant quantities, and deposited them in concentrations in the backwaters, shallows and, rarely, on steep sections of the meanders of the streams (Vereshchagin 1972). We believe that parts of the carcasses were buried here at the bottom of the ancient shallow waterbody. Obviously, the bodies of recently dead animals were attractive to ancient man, being an easily accessible source of protein. Human presence at the site is shown by a large number of stone tools (Ozherelyev 2010, 2017, 2019; Amirkhanov et al. 2012a, 2012b; Amirkhanov 2016).

Aquatic mollusks, fish and pond turtles are absent in the Muhkai 2 osteological assemblage (Sablin 2020). However, as noted above, a horizon of shells of terrestrial mollusks has been observed at the base of brownish-grey loams containing the osteological material (*Geophila* Férussac, 1819). Today, the mollusks inhabit the Caucasus open steppe and semi-desert areas, shrub thickets, meadows, and deciduous woodlands. In addition, one chela fragment from a semi-terrestrial freshwater crab *Potamon* sp. was found here. Recent *Potamon potamios* Olivier, 1804 lives in the Caucasus on the shores of mountain rivers with clean water. Obviously, the ancient Muhkai 2 waterbody was temporary and shallow. Small mammals are represented by Soricidae (1 bone), Leporidae (1 bone), Muridae (2 bones), as well as Arvicolinae – *Pitymimomys pitymyoides* Jánossy et Van Der Meulen, 1975 (5 bones) and *Ellobius* sp. (1 bone) (Amirkhanov et al. 2017). It should be noted that the recent northern mole vole *Ellobius talpinus* Pallas, 1770 lives in the Caucasus and prefers open landscapes, mostly steppes and forest-steppes with rich soils. The presence of the rhizodont vole *P. pitymyoides* in the microtheriofauna indicates that the upper limit of the age of this assemblage could be placed before the Villanyian-Biharian boundary, i.e. not younger than 1.77 Mya (Amirkhanov et al. 2017).

The osteological material from the cultural layers is rich enough to make a detailed reconstruction of the palaeogeographical situation and the natural environment in the region during the formation of the Muhkai 2 locality. All large mammal species from the site are inhabitants of open and semi-open landscapes and animals of forest biotopes are absent. The climate at this time was warm and quite arid. The area appears to have been a dry savannah-steppe with small patches of forest vegetation (Sablin 2020).

The origin of the Early Pleistocene Caucasian sites Dmanisi, Palan-Tyukan and Muhkai 2 was, most likely, similar, since the accumulation of the mammalian remains at all three localities was formed by slowly-flowing water (Sablin 2020). Regarding the ancient biotopes of Central Dagestan and Transcaucasia, the following can be noted. Firstly, Stenon horses dominate the spectrum of large mammals at Muhkai 2, whereas deer dominate at Dmanisi (Gabunia et al. 2000), and carnivores dominate at Palan-Tyukan (Sablin 1990, 2020; Sotnikova and Sablin 1993). The calculation was carried out using minimum numbers of individuals (MNI). Secondly, even a simple comparison of the lists of species of large mammals from these three sites clearly showed their environmental differences. For example, Thoral's badger *Meles thorali* Viret, 1950, Etruscan bear *Ursus etruscus* Cuvier, 1823 and European jaguar *Panthera gombaszoegensis* Kretzoi, 1938 from Dmanisi and Palan-Tyukan were forest inhabitants, as well as their modern descendants. Moreover, the remains of small deer, raccoon dogs, ancient buffalos, wild boars and otters were found in deposits at these two Transcaucasian sites (Sablin 1990, 2020; Sotnikova and Sablin 1993; Gabunia et al. 2000). The animals, seemingly, lived on the forested shores of fresh water rivers or lakes. Obviously, within the chronological range of 2.1–1.77 Mya the climate of Transcaucasia differed from the climate of northeastern Caucasus in being much more humid.

In Europe, the remains of the goral-like antelope are not found in deposits younger than 1.77 Mya, the remains of the Stenon horse and the bush-antlered deer are not found in deposits younger than 1.6 Mya, and the remains of the corsac-like fox are not found in deposits younger than 1.5 Mya (Amirkhanov et al. 2014, 2016a, 2017; Sablin 2020). In general the large mammal fauna from Muhkai 2 is similar to faunas dating to the end of the Middle and beginning of the Late Villafranchian from sites such as of Puebla de Valverde (Spain), Saint-Vallier, Chilhac and Senéze (France), Costa San Giacomo and Olivola (Italy), Liventsovka (Russia), Palan-Tyukan (Azerbaijan) and Dmanisi (Georgia), which existed during the interval 2.1–1.77 Mya (Sablin 1990, 2020; Kuzmina and Sablin 1991; Sotnikova and Sablin 1993; Sablin and Girya 2009, 2010; Vekua 1995; Rook and Martiinez-Navarro 2010; Amirkhanov et al. 2014, 2016a).

CONCLUSIONS

Based on the analysis of the osteological material from Muhkai 2, the following conclusions can be drawn: 1. Data on the theriofauna place the age of the cultural layers of the Muhkai 2 site within the chronological range of 2.1–1.77 Mya; 2. The brownish-grey loams containing the osteological material formed simultaneously and over a very short period of time; 3. The carcasses of large mammals were buried at the bottom of an ancient, slightly saline and shallow temporary body of water 4. Most likely, the animals died here due to natural causes, such as drowning; 5. During the formation of the Muhkai 2 site, the regional environment was dry savannah-steppe dotted with small patches of forest vegetation; 6. Within the chronological range of 2.1–1.77 Mya the climate of northeastern Caucasus was much more arid than the climate of Transcaucasia.

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